

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

## PCT

To:

see form PCT/ISA/220

### WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing  
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/JP2004/011582

International filing date (day/month/year)  
05.08.2004

Priority date (day/month/year)  
08.08.2003

International Patent Classification (IPC) or both national classification and IPC  
C01B37/02, G21K1/06

Applicant  
CANON KABUSHIKI KAISHA

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☒ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**International application No.  
PCT/JP2004/011582**JC20 Rec'd PCT/PTO 02 AUG 2005****Box No. I Basis of the opinion**

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.  
☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:  
☐ a sequence listing  
☐ table(s) related to the sequence listing
  - b. format of material:  
☐ in written format  
☐ in computer readable form
  - c. time of filing/furnishing:  
☐ contained in the international application as filed.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/JP2004/011582

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**Box No. II Priority**

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1. ☒ The following document has not been furnished:
- ☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).
  - ☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).
- Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.
2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.
3. Additional observations, if necessary:

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**Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	2-4,6-14
	No: Claims	1,5,15,16
Inventive step (IS)	Yes: Claims	2-4,6-14
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-16
	No: Claims	

2. Citations and explanations

see separate sheet

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**Box No. VI Certain documents cited**

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1. Certain published documents (Rules 43*bis*.1 and 70.10)

and /or

2. Non-written disclosures (Rules 43*bis*.1 and 70.9)

see form 210

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Reference is made to the following documents:

D1: S. BESSON, C. RICOLLEAU, T. GACOIN, C. JACQUIOD, J-P. BOILOT: "A New 3D Organization of Mesopores in Oriented CTAB Silica Films" JOURNAL OF PHYSICAL CHEMISTRY B, vol. 104, no. 51, 28 December 2000 (2000-12-28), pages 12095-12097, XP002304393

D2: D. GROSSO, A. R. BALKENENDE, P. A. ALBOUY, M. LAVERGNE, L. MAZEROLLES, F. BABONNEAU: "Highly oriented 3D-hexagonal silica thin films produced with cetyltrimethylammonium bromide" JOURNAL OF MATERIALS CHEMISTRY, vol. 10, no. 9, 25 August 2000 (2000-08-25), pages 2085-2089, XP002304394

D3: PATENT ABSTRACTS OF JAPAN vol. 2003, no. 03, 5 May 2003 (2003-05-05) & JP 2002 338229 A (CANON INC), 27 November 2002 (2002-11-27)

2. Document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and discloses a highly organized silica film having a 3D hexagonal structure. The film is produced by spin-coating a glass substrate with a CTAB-templated silica sol. HRTEM analysis is not consistent with the expected structure having 2D hexagonal stacking of cylindrical micelles with their axis oriented parallel to the film plane. Instead, the c-axis of the present hexagonal phase is perpendicular to the film plane and the diffraction pattern displays the effect of the  $6_3$  screw zone axis.

Document D2 discloses a similar 3D hexagonal mesoporous silica thin film formed by dip-coating on glass substrates or thin silicon wafers. X-ray diffraction data suggests that the organised domains are uniaxially oriented, with the  $C_6$  axis normal to the substrate surface.

3. The subject-matter of claim 1 does not differ from these known mesostructured films, thus the subject-matter of claim 1 is not new (Article 33(2) PCT).

Similarly, the structure of claim 15 is not novel over these disclosures.

Both D1 and D2 describe the removal of the surfactant from the mesostructured film to provide a mesoporous metal oxide film having the same symmetry as the mesostructured film. The subject-matter of claim 5 is therefore not new.

The features of claims 2-4 are not seen in the cited prior art, thus rendering said claims novel.

D3 discloses a method for the production of a mesostructured silica film on a substrate. Said method comprises i) preparing a substrate to have an anisotropic surface, ii) preparing a reactant solution containing a surfactant and an inorganic material precursor, and iii) forming the mesostructured film on the surface of the substrate. Step i) may either be achieved by coating the substrate with a high molecular weight polymer film, which is then rubbed to create the anisotropy, or by forming a Langmuir-Blodgett film of a high molecular weight polymer on the substrate surface. Step iii) may be achieved by immersing the substrate into the solution, using spin-coating or dip-coating techniques, or by the ink-jet method. The surfactant may subsequently be removed without destroying the mesopore structure.

The subject-matter of process claims 6-13 differs from the known method in that at least 2 surfactants are used in the present process, whereas only one surfactant is used in the method of the prior art. Thus, claims 6-13 are formally novel.

As there is no mention in the state of the art of the use of mesoporous silica films in X-ray optical devices, the subject-matter of claim 14 is new.

3. The problem to be solved by the present invention may be regarded as how to provide a mesostructured film, whose structure comprises surfactant molecular assemblies regularly arranged in three dimensions across the entire structure.

The solution to this problem proposed in claims 6-13 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

Although the process steps of claims 6-13 are all known from document D3, it is not known to employ 2 or more kinds of surfactants in the synthesis mixture. The applicant has shown, by way of examples, that when specific combinations of surfactants are used, a facile route is provided for the synthesis of a mesostructured film.

However, it is not thought that every combination of 2 or more kinds of surfactants will provide the structured obtained throughout the examples. Thus, said claims are not supported by the description as required by Article 6 PCT, as their scope is broader than justified by the description.

From the description on page 14 it follows that the nature of the surfactant is essential to the definition of the invention. The only surfactants mentioned as being suitable in the description are non-ionic surfactants containing ethylene oxide as a hydrophilic group. Furthermore, these are the only surfactants which have been shown to produce the desired mesostructured film (see examples). Since independent claims 6, 7 and 8 do not contain this feature they do not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential to the definition of the alleged invention.

Furthermore, the claims are directed to a mesostructured film containing, as the main component, an "inorganic material". There is no suggestion from the description that this inorganic material may be anything other than silica. Thus, the claims are not supported by the description as required by Article 6 PCT, as their scope is broader than justified by the description.

Similarly, claims 2-4 are thought to be inventive, although it is considered that the feature of claim 3, and possibly also that of claim 4, may be essential to the definition of the alleged invention.

The subject-matter of claim 14 is also considered to be inventive, as the mesostructured film of the present application finds use in an X-ray optical device.